

Kansas Department of Health and Environment  
Regulations Article 45a  
Underground Natural Gas Storage Wells

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Article 45a. Underground Natural Gas Storage Wells in Bedded Salt

28-45a-1. Definitions. (a) “Applicant” means the operator and the owner requesting a permit as specified in this article of regulations. If the operator and the owner are not the same person, the owner and the operator shall jointly submit an application for a permit.

(b) “Base gas” and “cushion gas” mean the volume of gas required as permanent storage inventory to maintain adequate storage cavern pressure for meeting minimum gas deliverability demands throughout the withdrawal season or for structural integrity of the storage cavern.

(c) “Brine” means saline water with a sodium chloride concentration equal to or greater than 90 percent.

(d) “Brine pond” means the excavated or diked structure used for the surface containment of brine used in the creation, maintenance, or operation of an underground storage well.

(e) “Department” means the Kansas department of health and environment.

(f) “Director” means the director of the division of environment of the department of health and environment.

(g) “Draft permit” means a document that is pending approval by the secretary to be issued as a permit.

(h) “In existence” and “existing,” when used to describe an underground natural gas storage well, mean a natural gas storage well that has been authorized or permitted by the Kansas department of health and environment before April 1, 2003.

(i) “Kansas board of technical professions” means the state board responsible for licensing persons to practice engineering, geology, or land surveying in Kansas.

(j) “Licensed geologist” means a geologist licensed to practice geology in Kansas by the Kansas board of technical professions.

(k) “Licensed professional engineer” means a professional engineer licensed to practice engineering in Kansas by the Kansas board of technical professions.

(l) “Licensed professional land surveyor” means a professional land surveyor licensed to practice land surveying in Kansas by the Kansas board of technical professions.

(m) “Liner” means the casing normally installed within the production casing.

(n) “Liquified petroleum gas” and “LPG” mean by-products or derivatives of oil and gas, including propane, butane, isobutane, and ethane, maintained in a liquid state under pressure.

(o) “Maximum allowable operating pressure” means the maximum pressure authorized by the department and measured at the wellhead.

(p) “Maximum operating pressure” means the maximum pressure recorded during a 24-hour period and measured at the product side of the wellhead.

(q) “Municipal population center” means an incorporated city.

(r) “Natural gas” means the gaseous form of hydrocarbon consisting primarily of methane.

(s) “Operator” means the person recognized by the secretary as being responsible for the physical operation of an underground natural gas storage facility.

(t) “Owner” means the person owning all or part of any underground natural gas storage facility.

(u) “Permit” means an authorization, license, or equivalent control document issued by the secretary to the operator and owner.

(v) “Permittee,” “permit holder,” and “holder of a permit” mean the owner and the operator issued a permit, as defined in this regulation, by the secretary.

(w) “Person” means any individual, company, corporation, institution, partnership, municipality, township, or federal agency.

(x) “Product” means natural gas.

(y) “Secretary” means the secretary of the department of health and environment.

(z) “Solutioning” means the process of injecting fluid into a well to dissolve salt or any other readily soluble rock or mineral.

(aa) “Supervisory control and data acquisition” means an automated surveillance system in which monitoring and control of storage activities are accomplished at a central or remote location.

(bb) “Underground natural gas storage cavern” means a cavern formed by solutioning in bedded salt in which natural gas is stored.

(cc) “Underground natural gas storage facility” means the acreage associated with the storage field with facility boundaries approved by the secretary. This term shall include the wells, wellbore tubular goods, wellhead, and any related equipment, including any appurtenances associated with the well field.

(dd) “Underground natural gas storage well” means a well used for the injection or withdrawal of natural gas into or out of an underground natural gas storage cavern.

(ee) “Usable water formation” means an aquifer or any portion of the aquifer that meets any of the following criteria:

- (1) Supplies any public water system;
- (2) contains a supply of groundwater that is sufficient to supply a public water system and that currently supplies drinking water for human consumption; or
- (3) contains fewer than 10,000 mg/L total dissolved solids and is not an exempted aquifer.

(ff) “Variance” means the secretary’s written approval authorizing an alternative action to the requirements of these regulations or the standards adopted by these regulations and incorporated into the permit.

(gg) “Working gas” means the gas placed in the storage cavern above the base gas. (Authorized by and implementing K.S.A. 65-171d; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)

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28-45a-2. Permit required. (a) No person shall create, operate, or maintain an underground storage well for natural gas in bedded salt without obtaining a permit from the secretary.

(b) Underground storage caverns for natural gas shall be constructed only in bedded salt.

(c) A variance may be granted by the secretary if both of the following conditions are met:

(1) The variance is protective of public health, safety, and the environment.

(2) The applicant or permittee agrees to perform additional testing, monitoring, or well improvements, or any combination of these, if required by the secretary.

(d) Each applicant or permittee seeking a variance shall submit a written request, including justification for the variance and any supporting data, to the secretary for review and consideration for approval. (Authorized by and implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)

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28-45a-3. Well conversions and reentry. (a) The conversion of an existing well to underground natural gas storage shall be prohibited if the well was not originally designed for the underground storage of natural gas, unless the secretary determines that the conversion is protective of public health, safety, and the environment.

(b) The conversion of an underground natural gas storage well for other purposes shall be prohibited, unless the secretary determines that the conversion is protective of public health, safety, and the environment.

(c) The reentry of a plugged underground natural gas storage well for the purpose of reactivating activities associated with the underground storage of natural gas or liquid hydrocarbons shall be prohibited. (Authorized by and implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)

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28-45a-4. Application for permit. (a) Each applicant shall submit a completed application for a permit to create, operate, and maintain an underground natural gas storage well, on an application form furnished by the department. Upon review of the application, one of the following shall be issued by the secretary:

- (1) A permit, if the application is approved; or
- (2) a notice that the permit has been denied if the applicant has not complied with the requirements of this article of regulations. The notice shall include justification for the permit denial.

(b) Each permittee of an existing underground natural gas storage well shall submit to the secretary, before April 1, 2004, either of the following:

- (1) A permit application for the continued operation of the storage well; or
- (2) a plan and schedule for plugging the well.

(c) The existing permit or authorization for the underground natural gas storage facility shall remain in effect until the requirement specified in subsection (b) is met and a permit for the underground natural gas storage well is issued. Each permittee of any existing underground natural gas storage cavern shall comply with the provisions of this article of regulations before injecting any working gas into the underground storage cavern.



(d) Each applicant for a permit for a new underground natural gas storage well shall submit a completed application to the secretary at least 180 days before the proposed commencement date for the construction of the new storage well. Construction shall not begin until the secretary has approved the permit application.

(e) Each permittee of an existing facility and each applicant for a proposed facility shall ensure that the underground natural gas storage facility will be operated and maintained in a manner that will preserve the integrity of the storage cavern and storage well and minimize any potential threat to public health, safety, and the environment.

(f) Each application for a permit shall include a report prepared by a licensed geologist that includes the following:

(1) An evaluation of the geology and hydrogeology, including cross-sections, isopach and structure maps of the salt formation, and water-level or potentiometric maps;

(2) a regional stratigraphic evaluation;

(3) local and regional structural analyses, including maps, cross-sections and available geophysical data;

(4) a flood assessment identifying floodplain and flood-prone areas, including the following:

(A) Flood response procedures; and

(B) design criteria for well and facility equipment; and

(5) an assessment of the potential for ground subsidence.

(g) Each applicant shall submit the following information with the permit application:

(1) A plan view map showing locations of all water, solution mining, monitoring, disposal, injection, oil, and gas wells within a one-mile perimeter of the facility's boundary; and

(2) a plan map view of man-made surface structures and construction activities within a one-mile perimeter of the facility's boundary.

(h) Each permittee shall submit a sample log of cuttings from each newly installed well at the facility to the secretary. The sample log shall be incorporated into the permit.

(1) Cuttings shall be collected at 10-foot intervals or an interval approved by the secretary from surface to total well depth.

(2) Well cuttings shall be collected, described, and logged as specified in department's document titled "procedure for sample logging, procedure #: UICLPG-9," dated July 2002, as adopted by reference in K.A.R. 28-45-6a.

(3) The collection of cuttings shall be supervised by a licensed geologist or a licensed geologist's designee.

(4) The description and logging of the sample cuttings shall be performed by a licensed geologist.

(5) Each permittee shall submit a sample log and a dry sample set to the department within 45 days after well completion.

(i) Each permittee shall provide a minimum of one core from each facility. The following provisions shall apply:

(1) The permittee shall submit a plan describing the coring interval, coring procedure, and core testing to the secretary for review and consideration for approval at least 60 days before the coring event.

(2) Each permittee shall make the core available for inspection upon request by the secretary.

(3) The permittee may submit existing core data if the secretary determines that the core is representative of the geology of the area.

(j) Each permittee shall submit open hole logs for any new underground natural gas storage well. The logging interval shall be from the surface to 100 feet below the top of the salt section. At a minimum, the following logs shall be run:

- (1) A gamma ray log;
- (2) a neutron log if the source is registered in Kansas, or a sonic log;
- (3) a density log; and
- (4) a caliper log.

(k) Any permittee may use an alternative log if the secretary determines that the alternative log is substantially equivalent to the logs specified in subsection (j). The permittee shall submit the following information:

- (1) A description of the log and the theory of operation for that log;
- (2) a description of the field conditions under which the log can be used;
- (3) the procedure for interpreting the log; and
- (4) an interpretation of the log upon completion of the logging event.

(l) Each permittee shall meet the following design requirements for each underground natural gas storage cavern:

(1) A minimum salt roof thickness of 100 feet above the washed storage cavern shall be maintained at all times.

(2) Underground communication between caverns through fracturing or coalescence shall be prohibited. Underground natural gas storage caverns where communication between caverns exists shall be plugged.

(3) The horizontal distance separating underground natural gas storage caverns shall be no less than 100 feet between cavern boundaries.

(4) The maximum horizontal diameter of each underground natural gas storage cavern shall not exceed 300 feet.

(m) Each permittee shall ensure the integrity of the storage well casing and the storage cavern before commissioning the storage cavern into service. Storage operations may commence when both of the following requirements are met:

(1) Each permittee shall submit a notice of completion of construction, on a form furnished by the department.

(2) Each new underground natural gas storage well shall be inspected by the secretary before storage operations commence. Storage operations shall not commence if the underground natural gas storage well fails the inspection. (Authorized by and implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)

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28-45a-5. Public notice. (a) Public notice shall be given by the secretary for any of the following permit actions:

- (1) A permit application for an underground natural gas storage well;
- (2) any modifications that require a draft permit;
- (3) any modifications for an existing storage facility;
- (4) the denial of a permit; or
- (5) a scheduled hearing.

(b) The public notice and, if applicable, a copy of the draft permit shall be mailed or electronically mailed by the department to the permit applicant.

(c) The public notice shall be mailed by the department to the following:

- (1) Any person who submits a written request for placement on the mailing list;
- (2) the official county newspaper of each county in which the lands affected by the application are located, for publication in at least two issues; and

- (3) the Kansas register.

(d) The public notice shall include the following information:

- (1) The name and address of the department processing the permit action for which the notice is being given;
- (2) the name and address of the person or company seeking the permit;

(3) a brief description of the business conducted at the facility or the activity described in the permit application;

(4) the name, address, and telephone number of the person that interested persons may contact for further information, including copies of the application, draft permit, or any other appropriate information;

(5) a brief description of the comment procedures for public notice; and

(6) a statement of the procedure to request a hearing and other procedures that allow public participation in the final permit decision.

(e) Any interested person may submit written comments to the secretary on any of the permit actions during the 30-day public comment period. The following requirements shall apply:

(1) All comments shall be submitted by the close of the public comment period.

(2) All supporting materials submitted shall be included in full and shall not be incorporated by reference, unless the supporting materials are any of the following:

(A) Part of the administrative record in the same proceeding;

(B) state or federal statutes and regulations;

(C) state or environmental protection agency documents of general applicability;

or

(D) other generally available reference materials.

(3) Commentators shall make supporting materials not already included in the administrative record available to the secretary.

(f) The response to all significant comments concerning any permit actions and the reasons for changing any provisions in the draft permit shall be issued when the final permit decision is issued.

(g) The response to comments shall be made available to the public upon request.  
(Authorized by and implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)

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28-45a-6. Modification and transfer of a permit. (a) The automatic transfer of a permit shall be prohibited. The requirements for each permit transfer shall be as follows:

(1) Each person requesting a permit transfer shall submit a completed application to the secretary at least 60 days before the effective date of the proposed transfer.

(2) Each permittee shall comply with the requirements of the existing permit until the secretary reissues the permit.

(b) Any permit for an underground natural gas storage well may be modified by the secretary under any of the following conditions:

(1) The secretary receives information that was not available when the permit was issued.

(2) The secretary receives a request for a modification.

(3) The secretary conducts a review of the permit file and determines that modification is necessary.

(c) Only the permit actions subject to modification shall be reopened.

(d) Minor modifications that shall not require public notification include the following, except as otherwise specified:

(1) Correction of typographical errors;

(2) requirements for more frequent monitoring or reporting by the permittee;

(3) a date change in a schedule of compliance;



(4) a change in ownership or operational control of the facility, unless the secretary determines that public notification is necessary to protect the public interest;

(5) a change in construction requirements, if approved by the secretary; and

(6) any amendments to a plugging plan.

(e) A draft permit and notification to the public shall be required if any of the following conditions is met:

(1) A permittee proposes substantial alterations or additions to the facility or proposes an activity that justifies a change in the permit requirements, including cumulative effects on public health, safety, and the environment.

(2) Information has become available that would have initially justified different permit conditions.

(3) Standards or regulations on which the permit was based have changed due to the promulgation of new or amended standards or due to a judicial decision after the permit was issued.

(f) Any permittee may request a permit modification within 180 days after any of the following:

(1) The adoption of new regulations or standards;

(2) any deadline to achieve compliance with regulations or standards before the expiration date of the permit; or

(3) any judicial remand and stay of a promulgated regulation if the permit condition was based on the remanded regulation. (Authorized by and implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)

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28-45a-7. Signatories for permit applications and reports. (a) Each permittee of an existing underground natural gas storage well and each applicant for a permit for a proposed underground natural gas storage well shall designate signatories to sign the permit applications and all reports required by the secretary.

(b) Positions that may be approved by the secretary to be signatories shall include the following:

- (1) Plant or operations manager;
- (2) cavern specialist;
- (3) superintendent; and
- (4) a position with responsibility at least equivalent to that required by the positions listed in this subsection.

(c) Any signatory may submit written notification to the secretary specifying a position having responsibility for the overall operation of the regulated facility or activity to act as a designated signatory.

(d) Each signatory and each signatory's designee shall submit a signature statement, on a form furnished by the department, with the permit application.

(Authorized by and implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)

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28-45a-8. Siting requirements for new underground natural gas storage wells. (a) Each applicant shall assess the geographical, topographical, and physical data for any proposed natural gas storage well location to determine whether the siting requirements have been met. The following siting requirements shall be met:

(1) Each new underground natural gas storage facility shall be located at least three miles from the established boundaries of municipal population centers.

(2) Each proposed new facility or boundary expansion for any existing facility shall be located as follows:

(A) Not less than five miles from an active or abandoned conventional shaft mining operation; and

(B) not less than two miles from the facility's boundary of any solution mining operation.

(3) Each applicant shall assess the extent and nature of current or past conventional subsurface mining activities within five miles of the underground natural gas storage facility boundary to determine any potential impact to public health, safety, or the environment resulting from proposed activities at the facility.

(4) Each applicant shall identify and assess all wells, including abandoned wells, from available sources of information, within a one-mile perimeter of the facility's boundary to determine if the following conditions exist:

(A) All wells have been constructed in a manner to protect public health, safety, and the environment.

(B) All abandoned wells, including oil, gas, water, and monitoring wells, have been properly plugged.

(b) Each applicant shall conduct a regional geological evaluation to determine if the integrity of the proposed storage cavern will be adversely affected by either of the following:

(1) Salt thinning due to any stratigraphic change; or

(2) a dissolution zone in the salt.

(c) Each applicant shall determine if the facility's location is in a floodplain or flood-prone area.

(d) No new underground natural gas storage facility boundary or the expansion of an existing facility's boundary shall be located less than one mile from any existing underground porosity storage facility.

(e) Each applicant shall identify potential risks to the storage operation from activities conducted at adjacent facilities.

(f) Each applicant shall identify all utilities having right-of-way, including pipeline, railway, roadway, and electrical lines, and shall assess the potential impact of the utilities on the location or operation of the storage facility. If facilities are exposed

and subject to hazards, including vehicular traffic, railroads, electrical power lines, and aircraft or shipping traffic, the facility shall be protected from accidental damage, by distance or barricades.

(g) No outer boundary of an underground natural gas storage cavern shall be less than 100 feet from any of the following:

(1) The property boundary of any owners who have not consented to subsurface storage under their property;

(2) any existing surface structure not owned by the facility's owner; or

(3) any public transportation artery. (Authorized by and implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug.8, 2003.)

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28-45a-9. Financial assurance for underground natural gas storage facility closure. (a)

Each permittee of an underground natural gas storage facility shall establish financial assurance for the following:

- (1) Closure of the facility; and
- (2) the plugging of any underground natural gas storage well.

(b) Each permittee of an existing underground natural gas storage well and each applicant for a permit for a new underground natural gas storage well shall submit proof of financial assurance with the permit application and, thereafter, annually on or before January 31 of each year. The following requirements shall apply:

(1) Each permittee and each applicant shall submit a detailed written estimate, in current dollars, of the cost to close all underground natural gas storage wells and storage caverns at the facility with closure procedures specified in K.A.R. 28-45a-18. The estimate shall be reviewed and approved by a professional engineer or licensed geologist.

(2) Each permittee and each applicant shall develop an estimate of the closure cost for all underground natural gas storage wells and storage caverns at the facility based on the cost charged by a third party to plug the underground natural gas storage wells.

(3) Each permittee shall increase the closure cost estimate and the amount of financial assurance provided if any change in the facility operation or closure plan increases the maximum cost of closure at any time.

(c) Each permittee shall provide continuous financial assurance coverage for closure until the secretary approves the facility closure.

(d) Each permittee and each applicant shall comply with the provisions of the department's document titled "procedure for demonstrating financial assurance for an underground natural gas storage well, procedure #: UICLPG-7, " dated March 2003, which is hereby adopted by reference. (Authorized by and implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)

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28-45a-10. Operations and maintenance plan. (a) Each permittee of an existing underground natural gas storage facility and each applicant for a permit for a new underground natural gas storage facility shall submit a plan for the long-term operation and maintenance of the facility with the permit application.

(b) Each operation and maintenance plan shall include the following:

(1) A description of the methods to be used to prevent the overpressuring of wells and storage caverns;

(2) a plan map view of the location of any disposal wells or corrosion control wells; and

(3) the location, depth, and construction details for all shallow and deep groundwater monitoring wells.

(c) Each permittee shall maintain at the facility and make available for inspection by the secretary the following information:

(1) A location map of all wells within the facility's boundaries and a listing of the global positioning system coordinates for each well;

(2) a schematic of the gathering line system that connects all wells within the underground storage facility to a central distribution point; and

(3) a schematic of the product lines for each cavern.



(d) Each permittee shall utilize a blanket pad to prevent the uncontrolled leaching of the storage cavern roof during solutioning or washing. Each permittee shall submit the description of a procedure for solutioning or washing the cavern, with the operations and maintenance plan, to the secretary for review and consideration for approval. The procedure description shall include the following:

- (1) A list of acceptable blanket pad materials;
- (2) the methods for monitoring the solutioning or washing process; and
- (3) a monitoring schedule.

(e) The criteria for determining the maximum allowable operating pressure shall be as follows:

(1) The maximum allowable operating pressure and test pressure shall not exceed 0.75 pounds per square inch per foot of depth measured at the higher elevation of either the casing seat or the highest interior elevation of the storage cavern roof.

(2) The storage cavern shall not be subjected to pressures in excess of the maximum allowable operating pressure, including pressure pulsations and abnormal operating conditions.

(f) Each permittee shall maintain a minimum operating pressure that is protective of cavern integrity at each underground natural gas cavern.

(g) Each permittee shall meet the notification requirements in the facility's emergency response plan, give oral notification to the department within two hours, and submit written notification within one week to the department if any of the following events occurs:

- (1) The overpressuring of a storage cavern;
- (2) the loss of integrity for the underground natural gas storage well;
- (3) the release of product or any other parameter that poses a threat to public health, safety, or the environment;
- (4) any other condition that could pose a risk to public health, safety, or the environment;
- (5) the establishment of communication between caverns;
- (6) the triggering of any alarms verifying that permit safety requirements have been exceeded; or
- (7) any equipment malfunction or failure that could result in potential harm to public health, safety, or the environment. (Authorized by and implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)

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28-45a-11. Emergency response plan and safety and security measures. (a) Each permittee of an existing underground natural gas storage facility and each applicant for a permit for a proposed underground natural gas storage facility shall prepare an emergency response plan as part of the permit application or the plugging plan. The following requirements shall apply:

(1) Each permittee and each applicant shall maintain the emergency response plan at the facility and at the company headquarters and shall make it available for inspection by the secretary.

(2) Each permittee and each applicant shall make a copy of the plan available to all coordinating agencies or committees involved in emergency response.

(b) Each permittee shall update the plan annually and also shall update the plan whenever new information regarding the requirements for the emergency response plan becomes available.

(c) Each plan shall include a description of the facility's response to the following events:

- (1) Spills and releases;
- (2) fires and explosions;
- (3) cavern subsidence and collapse; and

(4) any other activity that endangers public health and safety, or that constitutes a threat to the environment.

(d) Each plan shall include the following information:

(1) A description of the warning systems in operation at the facility;

(2) a description of the facility's emergency response communication system that includes the following:

(A) A plat showing the location of all occupied buildings within two miles of the facility's perimeter; and

(B) a list of addresses and telephone numbers for all persons to contact within two miles of the facility's perimeter if a release or emergency condition occurs;

(3) the procedures for coordination of emergency response with local emergency planning committees, including emergency notification and evacuation of citizens and employees;

(4) a description of employee training for emergency response;

(5) a plat of the facility, showing locations for the following:

(A) All underground storage wells;

(B) all underground injection control wells;

(C) all monitoring wells;

(D) all brine and product lines, if present;

(E) railroad and transportation routes;

(F) all brine ponds, if present; and

(G) any other appurtenances at the facility; and

(6) a plan map of all man-made surface structures and any construction activities within one mile of the facility's perimeter.

(e) Each permittee shall establish an educational program for community safety and awareness of the emergency response plan.

(f) Each permittee of an underground natural gas storage facility shall provide security measures to protect the public and to prevent unauthorized access. These security measures shall include the following:

(1) Methods for securing the facility from unauthorized entry and for providing a convenient opportunity for escape to a place of safety;

(2) clearly visible, permanent signs at all points of entry and along the facility's boundary, identifying the well or storage facility name, owner, and contact telephone number;

(3) security lighting;

(4) alarm systems;

(5) appropriate warning signs in areas that may contain accumulations of hazardous or noxious vapors or where physical hazards exist; and

(6) a direct communication link with the control room or remote control center for service and maintenance crews.

(g) Warning systems and alarms shall consist of the following:

(1) Leak detectors, fire detectors, heat sensors, pressure sensors, and emergency shutdown instrumentation shall be integrated with warning systems audible and visible in the local control room and at any remote control center;

(2) circuitry designed so that the failure of a detector or heat sensor, excluding meltdown and fused devices, will activate the warning; and

(3) a manually operated alarm, audible to facility personnel.

(h) Each wellhead and storage cavern shall be protected with safety devices to prevent pressures in excess of the maximum allowable operating pressure from being exerted on the storage well or storage cavern and to prevent backflow if a flowline ruptures.

(i) Each wellhead shall be equipped with manual isolation valves. Each port on each wellhead shall be equipped with either a valve or a blind flange. The valve or blind flange shall be rated at the same pressure as that for the wellhead.

(j) Each permittee shall install a supervisory control and data acquisition monitoring system approved by the secretary to monitor storage operations for individual storage caverns. Each of the following instruments shall be connected to an alarm:

(1) Flow indicators for natural gas;

(2) gas indicators; and

(3) pressure indicators on the product lines of the wellhead.

(k) Each permittee shall install emergency shutdown valves on all natural gas lines and, if present, brine or water lines. Each emergency shutdown valve shall meet the following requirements:

(1) Meet either of the following pressure-ratings:

(A) Be rated at least equivalent to 125% of the maximum pressure that could be exerted at the surface; or

(B) meet a pressure-rating standard equivalent to that specified in paragraph (k)(1)(A) and determined by the secretary to be protective of public health, safety, and the environment;

(2) fail to a closed position;

(3) be capable of remote and local operation; and

(4) be activated by any overpressuring in the natural gas system.

(l) Each permittee shall conduct annual inspections of all wellhead instrumentation.

(m) Each permittee shall function-test each critical control system and emergency shutdown valve semiannually.

(n) Each permittee shall perform trip testing of each loop, including the instrumentation, valves, shutdown equipment, and all wiring connections, to ensure the integrity of the circuit.

(o) Each permittee shall ensure that the equipment automatically closes all inlets and outlets to the storage cavern and safely shuts down or diverts any operation associated with the storage cavern, in case of overfilling or emergency.

(p) Each permittee shall ensure that the automatic valve closure times meet the valve design limits for closure times.

(q) Each permittee shall cease operations or shall comply with the instructions from the secretary if the secretary determines that an imminent threat to public health, safety, or the environment exists due to any unsafe operating condition. The permittee may resume operations if the secretary determines that the facility's operations no longer

pose a risk to public health, safety, or the environment. (Authorized by and implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)



Kansas Department of Health and Environment

Article 45a. Underground Natural Gas Storage Wells in Bedded Salt

28-45a-12. Design and construction of underground natural gas storage wells. (a) Each permittee of an existing underground natural gas storage well and each applicant for a permit for a new underground natural gas storage well shall ensure that each underground natural gas storage well is constructed with surface casing. The following requirements shall apply:

(1) Surface casing shall be set through all fresh and usable water formations and into competent bedrock.

(2) Surface casing shall be cemented by circulating cement through the bottom of the casing to the surface.

(3) The annular space between the casing and the formation shall be filled with cement.

(b) Each new and each existing underground natural gas storage well shall have double casing protection. The following requirements shall apply:

(1) The production casing shall extend a minimum of 105 feet into the salt formation.

(2) A tubing and mechanical packer assembly shall be installed inside the production casing.

(3) The packer shall be set at a depth approved by the secretary for the protection of public health, safety, and the environment.

(c) Each permittee of an underground natural gas storage facility shall install and maintain a corrosion control system. The following requirements shall apply:

(1) The corrosion control system shall be capable of protecting the well casings.

(2) The corrosion control system shall be assessed according to the protocol and time schedule recommended by the corrosion control system manufacturer, and the results reported to the secretary.

(d) The casing and tubing shall meet the performance standards for collapse resistance, internal yield pressure, and pipe body yield strength for the well's setting depths using criteria specified in the American petroleum institute's bulletin 5C2, twenty-first edition, dated October 1999, as adopted by reference in K.A.R. 28-45-15.

(e) Only new steel casing shall be installed in new underground natural gas wells. Used parts, materials, and equipment that have been tested and certified for continued service may be used for repairs.

(f) Liners shall extend from the surface to a depth near the bottom of the production casing allowing room for any workover operations.

(g) The following cementing requirements shall be met:

(1) The cement shall be compatible with the rock formation waters and the drilling fluids. Salt-saturated cement shall be used when cementing through the salt section.

(2) The cement across the confining zone and to the surface shall have a compressive strength of not less than 1,000 pounds per square inch.

(3) Remedial cementing shall be completed if there is evidence of either of the following:

(A) Communication between the confining zone and other horizons; or

(B) annular voids that would allow either fluid contact with the casing or channeling across the confining zone or above the confining zone.

(4) The following requirements for cement evaluation shall apply:

(A) Samples shall be obtained at the start and end of the cementing operation for evaluation of cement properties. All cement samples collected shall be representative of the cement being utilized.

(B) All samples shall be tested for compressive strength.

(C) A cement bond log shall be run on the surface casing, intermediate casing, and cemented production casing after the neat cement has cured for a minimum of 72 hours.

(h) Casing patches shall be prohibited, unless the secretary determines that the casing patches are protective of public health, safety, and the environment.

(i) Each permittee shall pressure-test the production casing for leaks when the well construction is completed.

(j) Each permittee shall submit a casing inspection base log for the entire cased interval for the innermost casing string or for the cemented liner that extends the entire length of the casing after the well construction is completed.

(k) Each container utilized in drilling or workover operations to contain workover wastes, drilling fluids, drilling mud, and drill cuttings shall be required to be approved in advance by the secretary. Drilling fluids, drilling mud, and drill cuttings shall be disposed of in a manner determined by the secretary to be protective of public health, safety, and the environment.

(l) A licensed professional engineer or licensed geologist, or licensed professional engineer's or licensed geologist's designee, shall supervise the installation of each underground natural gas storage well. (Authorized by and implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)

Kansas Department of Health and Environment

Proposed New Regulations

Article 45a. Underground Natural Gas Storage Wells in Bedded Salt

28-45a-13. Monitoring. (a) Each permittee shall ensure that each underground natural gas storage well is equipped with pressure sensors to continuously monitor wellhead pressures on the product line at the wellhead. The following requirements shall apply:

(1) The pressure sensor shall be capable of recording the maximum and minimum operating pressures during a 24-hour period.

(2) The pressure sensor shall be capable of recording operating pressures at an interval approved by the secretary.

(3) The permittee shall provide pressure data, including historic continuous monitoring, to the secretary upon request.

(b) Each permittee shall submit a plan for any monitoring activity, including logging and sonar surveys, to the secretary for review and consideration for approval to ensure the protection of public health, safety, and the environment, at least 60 days before the commencement of these monitoring activities.

(c) Each permittee shall submit a summary and the results of the monitoring activity to the secretary within 30 days after completion of the monitoring activity.

(d) Each permittee shall monitor the thickness of the salt roof for each cavern with gamma ray and density logs or other log specified in K.A.R. 28-45a-4 (k) as follows:

- (1) Every five years;
- (2) at any time that the secretary determines that cavern integrity is suspect; and
- (3) before plugging the well.

(e) Each permittee shall determine the cavern storage capacity and the cavern geometry with a sonar survey. The sonar survey shall be conducted as follows:

- (1) Before placing the natural gas storage cavern in service;
- (2) for determining the capacity of the natural gas storage cavern, if the capacity determined by the volume of gas injected into and withdrawn from the storage cavern does not correspond with the reported cavern capacity;
- (3) before plugging the well, if a sonar survey has not been run in the past five years;
- (4) for determining the stability of the cavern and the overburden, if the salt roof thickness and cavern geometry indicate that the stability of the cavern or overburden is at risk; and
- (5) after any solutioning that results in a solution volume increase of 20 percent or more of cavern capacity.

(f) Any permittee may use an alternative method for the sonar survey if the secretary determines that the alternative method is substantially equivalent to the method specified in subsection (e). The permittee shall submit the following information:

- (1) A description of the proposed method and the theory for its operation;
- (2) a description of the storage well and cavern conditions under which the log can be used;
- (3) the procedure for interpreting the survey results; and
- (4) an interpretation of the capacity and stability of the cavern upon completion of the survey.

(g) Each permittee of an underground natural gas storage well equipped with a production casing and a tubing and packer assembly shall monitor the annular space. Each permittee shall submit the following to the secretary for review and consideration for approval:

- (1) A diagram of the well construction; and
- (2) a plan for monitoring the annulus that includes the following:
  - (A) A diagram of the instrumentation for monitoring the annular pressure and fluid levels;
  - (B) a description of how the annular pressure and fluid levels will be recorded; and
  - (C) a description of, and justification for, the testing methods to demonstrate the mechanical integrity of the system.

(h) Each permittee shall submit a survey plan for monitoring ground subsidence, with the permit application, to the secretary for review and consideration for approval.

- (1) The survey plan shall include the following information:
  - (A) A description of the method for conducting the elevation survey; and

(B) the criteria for establishing monuments, benchmarks, and wellhead survey points.

(2) The criteria for subsidence monitoring shall be the following:

(A) Level measurements to the accuracy of 0.01 foot shall be made.

(B) Surface elevation changes in excess of 0.10 foot shall be reported within 24 hours to the department.

(C) No established benchmark shall be changed unless the permittee submits a justification that the change is protective of public health, safety, and the environment.

(D) If a benchmark is changed, the elevation change from the previous benchmark shall be noted in the elevation survey report.

(E) Each permittee shall submit the elevation before and after any wellhead work that results in a change in the survey point at the wellhead.

(3) The survey shall be conducted by a licensed professional land surveyor.

(4) Biennial survey results, including certified and stamped field notes, shall be submitted to the department within 30 days after completion of the survey.

(i) Each permittee shall submit an inventory balance plan for measuring the volume of natural gas injected or withdrawn from each underground natural gas storage well, including methods for measuring and verifying volume, to the secretary for review and consideration for approval. (Authorized by and implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)



Kansas Department of Health and Environment

Article 45a. Underground Natural Gas Storage Wells in Bedded Salt

28-45a-14. Testing and inspections. (a) Each permittee shall submit a plan to the secretary for review and consideration for approval to ensure the protection of public health, safety, and the environment before conducting any underground natural gas storage well or cavern testing. Testing shall not commence without prior approval from the secretary.

(b) Each permittee shall submit a summary of the test to the secretary within 45 days after completion of the test. The summary shall include the following:

- (1) A chronology of the test;
- (2) copies of all logs;
- (3) storage well completion information;
- (4) pressure readings;
- (5) volume measurements; and
- (6) an explanation of the test results.

(c) Each permittee shall test each underground natural gas storage well and each underground natural gas storage cavern for integrity. The following requirements shall apply:

- (1) Each permittee of any new underground natural gas storage cavern shall test for integrity using a nitrogen interface test before the cavern is initially placed in service.

(2) Each permittee shall conduct a hydraulic pressure test for each underground natural gas storage well every five years.

(3) Each permittee shall conduct a pressure test for each underground natural gas storage cavern every five years.

(4) Integrity tests shall be conducted as follows:

(A) After each workover;

(B) before injecting working gas into any existing underground natural gas storage well that was prohibited from being injected with working gas as specified in K.S.A. 55-1, 117 and amendments thereto; and

(C) before plugging the well.

(5) Each permittee shall submit a test procedure plan to the secretary, on a form furnished by the department, for review and consideration for approval, at least 60 days before test commencement. The plan shall include the following:

(A) The justification for the test parameters;

(B) the test sensitivities; and

(C) the pass and fail criteria for the test.

(6) Each permittee shall notify the secretary at least five days before conducting any integrity test.

(7) The integrity test shall be conducted at the maximum allowable operating pressure.

(8) All test procedures shall use certified gauges and pressure transducers that are calibrated annually.

(d) Any permittee may use an alternative integrity test method if the secretary determines that the alternative test method is substantially equivalent to the integrity test specified in subsection (c). The permittee shall submit the following information:

(1) A description of the test method and the theory of operation including the test sensitivities, a justification for the test parameters, and the pass and fail criteria for the test;

(2) a description of the well and cavern conditions under which the test can be conducted;

(3) the procedure for interpreting the test results; and

(4) an interpretation of the test upon completion of the test.

(e) Each permittee shall ensure the mechanical integrity of the underground natural gas storage cavern and well before placing the cavern and well into service.

(f) Each permittee shall submit a casing evaluation for each underground natural gas storage well. Acceptable casing evaluation methods shall include magnetic flux and ultrasonic imaging.

(g) Any permittee may use an alternative casing evaluation method if the secretary determines that the alternative casing evaluation method is substantially equivalent to the casing evaluation methods specified in subsection (f). The permittee shall meet the following requirements:

(1) Each permittee shall submit a description of the logging method, including the theory of operation and the well conditions suitable for log use.

(2) Each permittee shall submit the specifications for the logging tool, including tool dimensions, maximum temperature and pressure rating, recommended logging speed, approximate image resolution, and hole size range.

(3) Each permittee shall describe the capabilities of the log for determining the following:

(A) The presence of any metal loss due to either of the following:

(i) Internal or external corrosion; or

(ii) internal wear;

(B) the degree of penetration of the corrosion or the casing defect; and

(C) the circumferential extent of the corrosion or the casing defect.

(4) Each permittee shall submit a log and an interpretation of the log to the secretary.

(h) Each permittee shall submit a casing evaluation according to the following schedule:

(1) Every 10 years;

(2) before the injection of working gas in an existing underground natural gas storage well; and

(3) after any workover in which the injection string is pulled, if present.

(i) A licensed professional engineer or a licensed geologist, or a licensed professional engineer's or licensed geologist's designee, shall supervise all test procedures and associated field activity.

(j) A licensed professional engineer or a licensed geologist shall review all test results.

(k) Each permittee shall visually inspect the wellhead monthly for any leakage.

(l) Each permittee shall conduct an inspection of facility records, using a form furnished by the department, every two years to ensure that the required records are being properly maintained. The permittee shall maintain these records at the facility and shall make the records available to the secretary upon request. (Authorized by and implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)

Kansas Department of Health and Environment

Article 45a. Underground Natural Gas Storage Wells in Bedded Salt

28-45a-15. Groundwater monitoring. (a) Each permittee of an existing underground natural gas storage facility and each applicant for a permit for a new underground natural gas storage facility shall submit a groundwater monitoring plan with the permit application to the secretary for review and consideration for approval to ensure the protection of public health, safety, and the environment.

(b) Each permittee shall ensure that each groundwater monitoring well meets the following requirements:

(1) Each permittee shall set the screen in each shallow monitoring well at a depth that is inclusive of the seasonal fluctuation of the water table.

(2) Each permittee shall ensure that all deep groundwater monitoring wells extend a minimum of 25 feet into the bedrock, or to a depth based on the geology and hydrogeology at the facility and approved by the secretary.

(c) Each well location and the spacing between all well locations shall be based on the geology and the hydrogeology at the facility and approved by the secretary.

(d) Each permittee shall submit a quality assurance plan, including techniques prescribed for sampling and analysis, with the permit application to the secretary for review and consideration for approval to ensure protection of public health, safety, and the environment.

(e) Each permittee shall collect groundwater samples and analyze the samples for chlorides and any other parameter determined by the secretary to pose a threat to public health, safety, and the environment. The reporting format shall be determined by the secretary.

(f) Each permittee shall submit the results for chloride analyses from groundwater samples to the department on a quarterly basis.

(g) Each permittee shall monitor monthly for the presence of combustible gas in the headspace in monitoring wells and shall submit the results to the department on a quarterly basis.

(h) Each permittee shall submit a static groundwater level measurement for each monitoring well with the quarterly chloride results specified in subsection (f).

(i) Any permittee of an underground storage facility where groundwater chloride concentrations exceed 250 milligrams per liter may be required by the secretary to submit a work plan, for review and consideration for approval, that describes methods to delineate any potential source area and to control migration of the chloride contamination.

(j) Each permittee of a facility with any detection of combustible gas shall submit a work plan that describes the methods to eliminate any source areas and return the combustible gas levels to levels that do not pose a risk to public health, safety, and the environment. The plan shall be approved if the secretary determines that the plan is protective of public health, safety, and the environment. (Authorized by and

implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003;  
effective Aug. 8, 2003.)



Kansas Department of Health and Environment

Article 45a. Underground Natural Gas Storage Wells

28-45a-16. Record requirements and retention. (a) Each permittee shall complete and submit an annual report, on a form furnished by the department, on or before April 1 of each year. The annual report shall include the following:

- (1) A description of any incident of uncontrolled or unanticipated product loss;
- (2) the well number and date of any logs or sonar surveys conducted;
- (3) the estimated storage capacity for all unplugged caverns;
- (4) a list of any caverns being washed;
- (5) a list of the product volume injected and withdrawn for each well; and
- (6) a list, by well number, of the maximum and minimum product storage pressures encountered during the report year.

(b) Each permittee shall retain and maintain the following records at the facility for the following time periods:

- (1) For 10 years, the following records:
  - (A) The maximum and minimum operating pressures for each well; and
  - (B) the annual inspections required by the secretary;
- (2) for the life of the underground natural gas storage well, the following records:
  - (A) The casing records for each well;

- (B) the cementing records for each well; and
- (C) all workover records; and
- (3) for the life of the facility, the following records:
  - (A) All logging events;
  - (B) all mechanical integrity tests and other testing;
  - (C) all groundwater monitoring data; and
  - (D) all correspondence relating to the permit, including electronic mail.
- (c) Surface elevation surveys shall be maintained and retained for the life of facility plus 20 years after the facility's closure.
- (d) All required facility records, reports, and documents shall be transferred to the new permittee with the transfer of the permit. (Authorized by and implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)

Kansas Department of Health and Environment

Article 45a. Underground Natural Gas Storage Wells in Bedded Salt

28-45a-17. Well workovers. (a) Each permittee shall submit a workover plan to the secretary for review and consideration for approval to ensure the protection of public health, safety, and the environment. The following provisions shall apply:

(1) Each permittee shall submit the workover plan at least 10 days before performing any downhole or wellhead work that involves dismantling or removal of the wellhead.

(2) The permittee shall not be required to submit a workover plan for routine maintenance or replacement of gauges, sensors, or valves.

(3) Verbal authorization to initiate downhole or wellhead work may be issued by the secretary.

(b) Each permittee shall ensure that a blowout preventer with a pressure rating greater than the pressures to be encountered is used during each workover.

(c) Each permittee shall ensure that logging procedures are conducted through a lubricator unit with a pressure rating greater than the pressures anticipated to be encountered.

(d) Each permittee shall provide the person performing the logging or well workover with all relevant information concerning the status and condition of the well

and storage cavern before initiating any work. (Authorized by and implementing K.S.A. 2002 Supp. 55-1,117; effective, T-28-4-1-02, April 1, 2003; effective Aug. 8, 2003.)

Kansas Department of Health and Environment

Article 45a. Underground Natural Gas Storage Wells in Bedded Salt

28-45a-18. Plugging requirements. (a) Each permittee shall submit a plugging plan to the secretary for review and consideration for approval to ensure the protection of public health, safety, and the environment, at least 60 days before the plugging event.

(b) Each permittee shall follow plugging procedures specified in the department's document titled "procedure for the plugging and abandonment of a natural gas storage well, procedure #: UICLPG-8," dated March 2003, which is hereby adopted by reference.

(c) Each permittee shall restore and preserve the integrity of the site as follows:

(1) Dispose of all liquid waste in an environmentally safe manner;

(2) clear the area of debris;

(3) drain and fill all excavations;

(4) remove all unused concrete bases, machinery, and materials; and

(5) level and restore the site. (Authorized by and implementing K.S.A. 2002

Supp. 55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)

Kansas Department of Health and Environment

Article 45a. Underground Natural Gas Storage Wells in Bedded Salt

28-45a-19. Underground natural gas storage fees. (a) Effective on and after January 1, 2004, each permittee shall submit an annual permit fee of \$18,890 per facility and \$305 per unplugged underground natural gas storage well on or before April 1 of each year.

(b) Each permittee shall submit a permit fee of \$305 for any unplugged underground natural gas storage well inadvertently omitted from the collection of permit fees for the year 2003.

(c) Each applicant for a permit for a proposed new underground natural gas storage well shall submit a fee of \$700 with the permit application.

(d) Fees shall be made payable to the “Kansas department of health and environment – subsurface hydrocarbon storage fund.”

(e) The fees collected under the provisions of this regulation shall not be refunded.

(f) If the ownership of a storage well or storage facility changes during the term of a valid permit, no additional fee shall be required, unless a change occurs that results in a new storage well or an expanded facility operation. (Authorized by and implementing K.S.A. 2002 Supp.55-1,117; effective, T-28-4-1-03, April 1, 2003; effective Aug. 8, 2003.)